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SWINE INSPECTION

with Modified
Presentation and Control

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Slaughter Inspection Standards and Procedures Division
Meat and Poultry Inspection Technical Services

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SUMMARY

In response to industry requests to change the traditional method of viscera presentation to a system of presenting the viscera in hanging moving pans and on hooks, the Slaughter Inspection Standards and Procedures (SISP) Division evaluated the effectiveness and efficiency of new viscera and carcass inspection procedures. The new procedures, which were based on new facilities, equipment, and modified presentation methods, were then compared with the current procedure.

The methods of viscera presentation and the viscera inspection procedures evaluated were: (1) Traditional Method and Current Procedure; (2) Modified Method No. 1 and Procedure No. 1; (3) Modified Method No. 2 and Procedure No. 2. With the Traditional Method, plant employees placed all viscera in a pan and the inspectors performed the Current Procedure (Table 1). With Modified Method No. 1, plant employees placed intestine, stomach, and spleen in a pan, and trachea, lungs, heart, and liver on a hook, and the inspectors performed Procedure No. 1 (Table 2). With Modified Method No. 2, plant employees placed intestine, stomach, spleen, and liver in a pan, and the trachea, lungs, and heart on a hook, and the inspectors performed Procedure No. 2 (Table 2).

The methods of carcass presentation and the carcass inspection procedures evaluated were: (1) Traditional Method and Current Procedure; (2) Traditional Method and New Procedure. The traditional carcass presentation method and the steps sequence of the current carcass inspection procedure were not changed to evaluate the new procedure; however, the routine grasping, turning, and observing the kidneys were replaced--in the new procedure-- by observing one side of the kidneys, and by grasping, turning and observing the other side only if necessary.

The effectiveness evaluations revealed no significant differences among the procedures; however, the new procedures showed an increase in inspectors' efficiency. Therefore, it is recommended that, at plant management's option, the test plant be allowed to operate with one of the three methods of viscera presentation used during the study, but to select Modified Method No. 2, which requires the inspectors to perform Procedure No. 2. The combination of this method and procedure is recommended because it proved to be more effective and productive than the other combinations for both, inspection and plant personnel.

INTRODUCTION

Management of a newly constructed swine slaughter plant proposed to operate under Federal inspection using a combination of American and European made equipment. This equipment, designed to allow different methods of presenting heads, viscera, and carcasses for inspections, requires new inspection and control systems.

In response to the plant's proposal, the Slaughter Inspection Standards and Procedures Division (SISP) conducted a study on current and modified methods of presentation, and on new inspection procedures and controls.

Because of its complexity, the study was divided into phases and steps. This report describes how the study was conducted during Phase I; a separate report for other phases will be developed later. Phase I includes the following steps:

1. Operate with approved presentation methods and perform current inspection procedure. Complete adjustments of facilities, equipment, and operations. Identify modified presentation methods and new inspection procedures.

2. Continue operating with approved presentation methods. Select and practice modified presentation methods and new

inspection procedures. Institute alternative ante-mortem inspection. Design and conduct a feasibility study.

3. Design, develop, and conduct a study on modified presentation methods and on new, feasible, effective and efficient inspection procedures.

OBJECTIVE

The objectives of the study during Phase I were to:

- o Identify modified presentation methods and new inspection procedures.
- o Institute effective and efficient alternative ante-mortem inspection.
- o Select and evaluate the most feasible, effective and efficient modified presentation methods and new inspection procedures.
- o Compare effectiveness and efficiency of current and new methods and procedures.

The head and carcass presentation methods and the head inspection procedure were not changed during Phase I; therefore, the study objectives, during this phase, were to evaluate the modified viscera presentation methods and to test and compare the effectiveness and efficiency of new and current viscera and carcass inspection procedures.

BACKGROUND

USDA Responsibility

The Federal Meat and Poultry Inspection Acts require that inspectors perform ante-mortem and post-mortem inspection of livestock and poultry. The primary purpose of post-mortem inspection is to detect signs of diseases and other unwholesome conditions that may render carcasses, or some of their organs, unfit for human food. Carcasses or organs determined to be unwholesome are condemned and properly disposed of under inspector's supervision.

USDA has many responsibilities. One of them is to design and develop the most effective and efficient methods of inspecting animals at slaughter. To accomplish this, special studies are routinely conducted by SISP to evaluate the existing inspection systems, to design and develop new systems, and to determine and compare the effectiveness and efficiency of existing and new systems. During these studies, thousands of carcasses and organs are inspected by trained inspectors and are then carefully evaluated by veterinary medical officers.

Post-mortem inspection requires an appreciable portion of USDA's budget. Therefore, USDA's ongoing responsibility for

efficient utilization of its resources is especially important with respect to post-mortem inspection. A failure to use the most efficient inspection procedures could result in costs to the American consumers which would be significantly higher than necessary.

Routine Inspection

Routine post-mortem inspection of swine (Table 1) is divided into three phases: head inspection, viscera inspection and carcass inspection. During each phase, inspectors perform specific tasks, which involve a sequence of observing, palpating, and incising certain tissues and lymph nodes. These tasks have proved to be an effective and efficient method of inspection.

When carcasses are affected by a disease or abnormality, such carcasses are retained for "final" examination by veterinary medical officers who, depending upon the disease or abnormality, perform thorough and expanded examinations by observing, palpating, and incising tissues and lymph nodes.

Number of Inspectors

In general, the number of inspectors assigned to swine post-mortem inspection at a plant is related to the size of the

plant and the speed of operation. In small plants with a slow slaughter rate, one inspector may complete all inspection tasks at one station; in larger plants with faster line speeds, two or more inspectors complete the inspection procedure at the head, viscera, and carcass stations.

At the test plant, routine post-mortem inspection is carried out at three stations by six inspectors--two at the head inspection station, three at the viscera inspection station, and one at the carcass inspection station.

During viscera inspection, the inspectors examine all organs to determine whether they are fit for human food. It is during this phase of inspection that the organs can be examined easily, if they are presented for inspection so the inspectors can readily observe and/or palpate them.

Table 1 -- Current Swine Post-Mortem Inspection 1/

Inspection Station	Step	Procedure
Head	1.	Observe head and cut surfaces
	2.	Incise and observe mandibular lymph nodes
	3.	Observe/retain carcass when required

Viscera	1.	Observe eviscerated carcass, viscera, and parietal (top) surface of spleen
	2.	Observe and palpate mesenteric lymph nodes
	3.	Palpate portal lymph nodes
	4.	Observe dorsal surfaces of lungs
	5.	Palpate bronchial lymph nodes
	6.	Observe mediastinal lymph nodes
	7.	Turn lungs over and observe ventral surfaces
	8.	Observe heart
	9.	Observe dorsal surface of liver
	10.	Turn liver over and observe ventral surface
	11.	Condemn viscera or parts when required
	12.	Retain carcass, viscera, and parts when required

Carcass	1.	Look in mirror and observe back of carcass
	2.	Observe front parts and inside of carcass
	3.	Grasp, turn, and observe kidneys (both sides)
	4.	Direct trim, remove retain tags, or retain carcass when required

1/ Inspectors must examine carcasses, organs, and parts for diseases, abnormalities, cleanliness.

METHODOLOGY

Designation of Experts

Scientific and technical experts from various Agency programs and areas of the United States were designated and formed a study team. This team was divided into a planning and evaluation staff and an inplant testing staff. The first group designed and developed the necessary tasks to evaluate the current and new presentation methods and inspection procedures, and evaluated and analyzed the data collected during the study. The second group conducted the inplant evaluations and collected all necessary data.

Type of Plant

The inplant evaluations and data collections were done from May 6 to 14, 1986, at a newly constructed plant slaughtering market hogs on a moving line of about 780 hogs per hour and using mechanized American and European equipment.

Head/Carcass Presentation

The carcasses were scalded, shaved, cleaned, and eviscerated while suspended from a moving rail. After the heads were disarticulated at the atlanto-occipital joint and were left hanging freely from the carcasses by a small section of the

neck skin, the carcasses were split and positioned so that their backs faced the inspectors at the head inspection station. After leaving this station, the carcasses were positioned so that their ventral surfaces faced the viscera and carcass inspectors. These methods of presenting heads and carcasses remained unchanged during Phase I of the study.

Viscera Presentation Methods

Traditional Method. During evisceration, the abdominal and thoracic viscera from each swine carcass were removed, together and intact, and were placed in a suspended moving pan so that inspectors did not need to perform additional motions to inspect them. This is the most common method of viscera presentation, which seems to be very efficient especially in large size slaughter operations.

Modified Method No. 1. With this method of presentation, handling of the heads and carcasses did not change; however, the viscera were handled differently. First, the eviscerator removed the intestine, stomach, and spleen--after making an incision through the esophagus about 2 inches cranial to its junction with the stomach--and placed them in the moving pan. Then, he removed the remaining viscera (liver, heart, lungs) and hung them by the trachea on a hook located above and to

the trailing side of the pan. He was required to hang the trachea with the lungs' dorsal surfaces facing the inspectors, so that the lungs and lymph nodes could be easily observed and palpated when required.

Modified Method No. 2 As with the other modified method, handling of the heads and carcasses was not changed. Following this method, the eviscerator first removed from the carcass the stomach, intestine, spleen, and liver and placed them in a moving pan; then, he removed the trachea, heart, and lungs and hung them by the trachea on a hook with the lungs' dorsal surfaces facing the viscera inspectors. Plant management believes that both modified methods will offer benefits to the plant operations without changing the quality of the product or the effectiveness of inspection.

Method/procedure relation. When the eviscerators used the traditional method, the inspectors performed the current inspection procedure (Table 1); when they used the modified methods, the inspectors performed the new procedures (Table 2).

Head/Carcass Inspection

The steps or sequence of the current head and carcass inspection procedure (Table 1) were not affected by the modified methods

Table 2 - New Swine Post-Mortem Inspection 1/

Inspection Station	Step	Procedure No. 1	Step	Procedure No. 2
Head	1.	Observe head and cut surfaces	1.	Observe head and cut surfaces
	2.	Incise and observe mandibular lymph nodes	2.	Incise and observe mandibular lymph nodes
	3.	Observe/retain carcass, when required	3.	Observe/retain carcass, when required

Viscera	1.	Observe <ul style="list-style-type: none"> - Viscera in pan - Top surface of spleen 	1.	Observe <ul style="list-style-type: none"> - Viscera in pan - Top surface of spleen - Dorsal surface of liver
	2.	Observe and palpate mesenteric lymph nodes	2.	Observe and palpate mesenteric lymph nodes
	3.	Observe <ul style="list-style-type: none"> - Viscera on hook - Dorsal surfaces of lungs - Mediastinal lymph nodes 	3.	When required, turn liver and observe ventral surface
	4.	Grasp trachea and palpate bronchial lymph nodes	4.	Observe <ul style="list-style-type: none"> - Viscera on hook - Dorsal surfaces of lungs - Mediastinal lymph nodes
	5.	Turn trachea and observe <ul style="list-style-type: none"> - Heart - Ventral surfaces of lungs - Dorsal surface of liver 	5.	Grasp trachea and palpate bronchial lymph nodes
	6.	When required <ul style="list-style-type: none"> - Turn liver and observe ventral surface - Observe eviscerated carcass - Condemn viscera or parts - Retain carcass, viscera and parts 	6.	Turn trachea and observe <ul style="list-style-type: none"> - Heart - Ventral surfaces of lungs
			7.	When required <ul style="list-style-type: none"> - Observe eviscerated carcass - Condemn viscera or parts - Retain carcass, viscera and parts

Carcass	1.	Look in mirror and observe back of carcass	1.	Look in mirror and observe back of carcass
	2.	Observe front parts and inside of carcass	2.	Observe front parts and inside of carcass
	3.	Observe kidneys; grasp, turn, and observe when required	3.	Observe kidneys; grasp, turn, and observe when required
	4.	Direct trim, remove retain tags, or retain carcass when required	4.	Direct trim, remove retain tags, or retain carcass when required

1/ Inspectors must examine carcasses, organs, and parts for diseases, abnormalities, cleanliness.

of presentation; therefore, they were not changed during Phase I of the study. However, the routine grasping, turning, and observing the kidneys were replaced by observing one side and by grasping, turning, and observing the other side only when required.

Viscera Inspection

Current procedure. The current procedure (Table 1) requires the inspectors to observe the eviscerated carcasses for disease conditions and dressing errors, and to observe and/or palpate various abdominal and thoracic structures, including the liver, spleen, lungs, heart, stomach, intestine, and lymph nodes. Other duties of the viscera inspectors include retaining carcasses for veterinary disposition and marking condemned viscera or parts. In the current procedure, the inspectors examine the viscera presented for inspection all together in moving pans.

New procedures. Two new procedures (Table 2) were tested and compared with the current procedure during the study. Procedure No. 1 was done with Modified Method No. 1; Procedure No. 2 with Modified Method No. 2. Both procedures required the inspectors to perform duties similar to those performed with the current procedure. However, each inspector

first examined the viscera in a suspended moving pan, then examined the remaining viscera hung by the trachea on a moving hook.

Difference in procedures. Based on the facilities and evisceration procedures required by the modified methods of viscera presentation, the steps sequence of both new procedures of viscera inspection was changed from that of the current procedure. In addition, in both new procedures, palpation of the portal lymph nodes was omitted and the liver's ventral surface and eviscerated carcass were observed only when necessary. The steps sequence of the new carcass inspection procedures was not changed; however, the routine grasping, turning, and observing all kidneys were replaced by observing only, and by grasping, turning, and observing them when necessary.

Training

Before testing, training of plant and inspection personnel was necessary. Therefore, the project manager, the project officer in charge, and a member of the Program Training Division visited the test plant before the inplant testing. During the visit, they conducted on-the-job training meetings and trained involved plant employees to perform the modified presentation methods;

then, they trained the veterinary inspector in charge and the inspectors assigned to post-mortem inspection to perform the new inspection procedures. Training continued until the plant employees did the presentation methods properly and the inspectors were confident in performing the new inspection procedures.

Evaluation

Evaluation sites and evaluators. To evaluate and compare the effectiveness of the current and new inspection procedures, two evaluation sites were used, which were next to or down the line from the inspection stations. At the viscera evaluation site, four veterinary medical officer evaluators--two evaluators, one evaluator/recorder and one evaluator/backup -- examined the units, recorded on worksheets any lesions or errors missed by the inspectors, and assured that all units inspected with the new procedures met the standards of wholesomeness. At the carcass evaluation site, three veterinary medical officer evaluators--one evaluator, one evaluator/recorder and one evaluator/backup--performed the same tasks on units inspected with the current and new procedures.

Selection of evaluations. Before the beginning of the first evaluation and thereafter each day, the project officer in charge wrote on separate pieces of paper the abbreviation codes of the methods of presentation (Traditional, Modified No. 1, Modified No. 2) and the inspection procedures (Current, Procedure No. 1, Procedure No. 2) to be evaluated. He folded those pieces of paper and randomly selected them to determine which method of presentation and which procedure should be done first, second, etc. This selection was unknown to the evaluators. The remaining evaluations were alternated during the day. For example: If the Traditional Method was used and the Current Procedure was evaluated first; if the Modified Method No. 1 was used and Procedure No. 1 was evaluated second; if the Modified Method No. 2 was used and Procedure No. 2 was evaluated third; if the Current Carcass Procedure was evaluated fourth; and if the New Carcass Procedure was evaluated fifth, then the Traditional Method was used and the Current Procedure was evaluated sixth, or the second time during the day.

Evaluators' and inspectors' assignments. Each day, before the beginning of the first evaluation, the project officer in charge wrote the abbreviation codes of the veterinary medical officer

assignments on separate pieces of paper, folded these pieces of paper and randomly selected them to determine who would serve first as evaluator, evaluator/recorder, and evaluator/backup.

During each evaluation, testing of the sampled units was accomplished by following a rotational system. The inspectors performing the different procedures and the veterinary medical officer evaluators were instructed by the project officer in charge when and how to rotate. This gave an opportunity to the inspectors to perform and to the veterinary medical officer evaluators to evaluate all procedures.

Pilot test. After training, when plant employees were able to do the methods of presentation properly and the inspectors were confident in performing the appropriate procedures correctly, a pilot test began. This test was designed to allow plant employees, inspectors, and evaluators to become familiar with the testing process, and to allow the project officer in charge to make any adjustments before the actual test began. During the pilot test, data were collected and reviewed, but were not included in the study.

Presentation and procedure review. During the pilot test and before the beginning of each evaluation, the project officer in charge reviewed the methods of presenting the units for

inspection and instructed designated plant representatives to make any adjustments, if necessary. Then, he instructed the inspectors to perform the designated procedure. He delayed the beginning of the evaluation until he reviewed and determined that all units were properly presented for inspection and the inspectors performed the appropriate procedure correctly.

Procedure of evaluation. The inspection procedures were performed by the inspectors regularly assigned to the test plant. The evaluation procedures were performed by veterinary medical officer evaluators.

Upon completion of the pilot test, the actual test began. After the units were inspected by the inspectors, they were closely examined on the line by the evaluators, who were located next to or down the line from the inspection stations. While the evaluators examined the units, an evaluator/recorder evaluated the tasks, observed the units, and recorded any disease or abnormality detected during the evaluation.

To assure that products inspected by the new procedures met the standards for wholesomeness, all units subjected to these procedures during testing received an additional (backup)

inspection. Also, when diseases or abnormalities were detected, the inspectors and evaluators took the necessary actions as required by regulations.

Tasks of viscera evaluation. The tasks of viscera evaluation were as follows:

A. Traditional Method and Current Procedure.

1. Plant employee removed viscera intact from carcass and placed them in pan.

2. Inspector performed current inspection procedure.

3. Evaluator evaluated every other set of viscera.

4. Evaluator/recorder observed and recorded diseases or abnormalities on worksheets.

B. Modified Method No. 1 and Procedure No. 1.

1. Plant employee:

a. Removed from carcass stomach, intestine, and spleen and placed them in pan.

b. Removed from carcass trachea, lungs, heart, and liver and hung them by trachea on hook with lungs' dorsal surfaces facing viscera inspector.

2. Inspector performed Procedure No. 1.

3. Evaluator evaluated every other set of viscera.

4. Evaluator/recorder observed and recorded diseases or abnormalities on worksheets.

5. Evaluator/backup examined (observed) all viscera and performed current inspection procedure on those not evaluated.

C. Modified Method No. 2 and Procedure No. 2.

1. Plant employee:

a. Removed from carcass stomach, intestine, spleen, and liver and placed them in pan.

b. Removed from carcass trachea, lungs, and heart, and hung them by trachea on hook with lungs' dorsal surfaces facing viscera inspector.

2. Inspector performed Procedure No. 2.

3. Evaluator evaluated every other set of viscera.

4. Evaluator/recorder observed and recorded diseases or abnormalities on worksheets.

5. Evaluator/backup examined (observed) all viscera and performed current inspection procedure on those not evaluated.

Tasks of carcass evaluation. The tasks of carcass evaluation were as follows:

A. Traditional Method and Current Procedure.

1. Plant employee presented all carcasses for inspection as required.

2. Inspector performed current carcass inspection procedure.

3. Evaluator evaluated (only) the kidneys.

4. Evaluator/recorder observed and recorded diseases or abnormalities on worksheets.

B. Traditional Method and New Procedure.

1. Plant employee presented all carcasses for inspection as required.

2. Inspector performed new procedure.

3. Evaluator evaluated (only) the kidneys.

4. Evaluator/recorder observed and recorded diseases or abnormalities on worksheets.

5. Evaluator/backup examined (observed) all kidneys and performed current inspection procedure on those not evaluated.

Sampling

Selection of units. At the viscera evaluation site, one unit consisted of a complete set of viscera, whether it was presented for inspection in a pan, or in a pan and on a hook. At the carcass evaluation site, one unit consisted of both kidneys; however, if one kidney was missing, the one present was considered as one unit.

Upon completion of the pilot test, the actual test began. The evaluators randomly selected 100 units as follows: When instructed by the project officer in charge, they selected a unit as it went by on the line. This unit was not to be examined, but to be used as a starting point. The evaluators then selected the sixth unit (following this starting point) as the first one to be evaluated. This procedure was done

at the beginning of each evaluation. The evaluators examined the unit and recorded any disease or abnormality detected on worksheets.

When the evaluators completed the first unit, they selected the next one as it became available, examined it, and had the results recorded. The remaining units were selected (examined and results recorded) as they became available until 100 were examined and the results recorded.

In addition to serving as an observer and recorder, the evaluator/recorder occasionally was asked by the evaluators to examine questionable lesions so that an accurate diagnosis could be made. The evaluators also had the option of retaining the units, when necessary, for closer examination.

Number of units. Each day for approximately 6 days, the evaluators randomly selected and evaluated, at the viscera evaluation site, 200 units presented for inspection with the Traditional Method and inspected with the Current Procedure; 200 presented with Modified Method No. 1 and inspected with Procedure No. 1; and 200 presented with Modified

Method No. 2 and inspected with Procedure No. 2; at the carcass evaluation site, they selected and evaluated 200 units inspected with the Current Procedure and 200 inspected with the New Procedure. A total of 6000 units were evaluated during the study.

Effectiveness data; worksheets. Following the instructions in Appendix A, the evaluation results were recorded on worksheets (Appendix B). The evaluators examined the units, as instructed, for diseases and abnormalities. Each unit examined and each lesion or error missed by the inspectors were tallied and recorded on worksheets.

Review of worksheets. Upon completion of each worksheet, the project officer in charge reviewed all entries and initialed in the appropriate space. Then, he instructed the designated plant representative(s) to make the appropriate presentation changes for the next procedure to be evaluated. He delayed the evaluation until plant employees, inspectors, and evaluators adjusted to the different methods of presentation and inspection.

Work measurement data. During the study, work measurement data were also collected. These data included video taping the inspectors while performing the new procedures and the recording of any other data involved, such as washing hands, condemning viscera or parts, retaining carcasses, etc.

RESULTS

Summary of Results

All data collected during the inplant evaluations were reviewed and analyzed. The results are summarized in Table 3, Summary of Viscera Evaluation Results, and Table 4, Summary of Carcass (Kidney) Evaluation Results. These tables include: (1) Inspection procedure; (2) number of units evaluated for each procedure; (3) type of errors; (4) total number of units free of errors; (5) percent of units free of errors; and (6) 95 percent confidence interval.

Table 3 - Summary of Viscera Evaluation Results

Inspection Procedure <u>1/</u>	Type of Error	<u>Units Free of Errors</u>		CI 95% <u>2/</u>
		Total	Percent	
Current	Pathological	1167	97.2	96.3-98.1
	Dressing	1191	99.2	98.7-99.7
	Total	1158	96.5	95.5-97.5

No. 1	Pathological	1187	98.9	98.3-99.5
	Dressing	1185	98.7	98.1-99.3
	Total	1172	97.7	96.8-98.5

No. 2	Pathological	1176	98.0	97.2-98.8
	Dressing	1194	99.5	99.1-99.9
	Total	1170	97.5	96.6-98.4

1/ Units evaluated for each procedure: 1,200

2/ Confidence interval: 95 percent

Table 4 - Summary of Carcass(Kidney) Evaluation Results

Inspection Procedure <u>1/</u>	Type of Error	Units Free of Errors		CI 95% <u>2/</u>
		Total	Percent	
Current	Pathological	1134	94.5	93.1 - 95.7
	Dressing	1200	100.0	99.7 - 100.0
	Total	1134	94.5	93.1 - 95.7

New	Pathological	1152	96.0	94.7 - 97.0
	Dressing	1200	100.0	99.7 - 100.0
	Total	1152	96.0	94.7 - 97.0

1/ Units evaluated for each procedure: 1,200

2/ Confidence interval: 95 percent

Analyses

While the effectiveness tests were being conducted, a Program Training Division officer performed a training task analysis (Appendix C).

To determine the statistical values of the data collected, the Mathematics and Statistics Division summarized and evaluated the data and performed a statistical analysis (Appendix D).

Summaries of the data are in Tables 3 and 4. Although these summaries show some differences among the procedures, the differences were not significant.

To determine the inspection time required to perform the new procedures, the Industrial Engineering and Data Management Division collected the work measurement data and performed a workload analysis (Appendix E). This analysis shows that, at the test plant, both new procedures were more efficient than the current procedure.

Note on Results

All dressing or pathological errors detected during evaluation of the current and new procedures were slight, localized, chronic, and did not affect carcass disposition.

DISCUSSION

Responsibility

As for the current inspection procedure, plant management has to assure that all viscera are presented for inspection adequately so that the inspectors need not perform additional motions to examine them. The eviscerators should present the viscera in the pans and on the hooks properly, such as placing the spleen with the parietal (top) surface exposed, hanging the trachea on the hook with the lungs' dorsal surfaces facing the inspectors, etc.

To prevent carcass and/or viscera contamination, line stops, and inspectors frequent hand washing, the evisceration procedure should be accomplished without cutting the stomachs or intestines.

The new procedures will not change any of the inspectors' other responsibilities. For example, when a disease condition or a dressing error requires action on the inspectors' part, such as tagging the carcass and viscera, the inspectors will take that action.

Test Variability

To prevent or reduce variability and bias, the evaluation process was based on the following:

1. The methods of presentation and the procedures to be tested were randomly selected each day.

2. The evaluators were positioned next to or down the line from the inspection stations and could see the inspectors and the procedures being performed. However, they were instructed to examine all units thoroughly and record any errors missed by the inspectors regardless of the procedures used. Also, they were instructed to evaluate and record 100 units and, when one worksheet was completed, to repeat the evaluation and recording for 100 more units; this was done until the required number of units was reached.

3. During the evaluation and recording of each 100 units, the project manager and/or the project officer in charge frequently reviewed the presentation, inspection, and evaluation procedures.

4. The procedures were so evaluated that carcasses of animals from the same lots were used.

5. The evaluations were spaced out and alternated during the study.

6. When one worksheet was completed, it was identified with the procedure that had been evaluated.

7. The inspectors rotated assignments and each one had an opportunity to perform the procedures being tested.

8. The evaluators alternated duties so that each one served as evaluator, evaluator/recorder, and evaluator/backup.

Limitations

The evaluations were conducted at one plant, which was not randomly selected. Any inferences to other plants would be judgmental.

When a unit or part of a unit was retained or condemned, it was assumed that the inspectors noted all lesions for which the unit or part of the unit should have been retained or condemned.

CONCLUSION AND RECOMMENDATION

The evaluations conducted during this study revealed that the new inspection procedures are as effective as and more efficient than the current procedure. As the current procedure, they detect the same diseases or abnormalities, achieve the same inspection quality, and assure the same consumer protection. In addition, they reduce the time required to complete inspection, decrease inspectors' fatigue, and make inspectors' work easier. Therefore, it is recommended that:

1. At plant management's option, inspection personnel allow the test plant to operate with any of the three methods of presentation used during the study--Traditional Method, Modified Method No. 1, and Modified Method No. 2.

2. Upon plant management's request to operate with the:

- a. Traditional Method, which requires presenting for inspection all viscera, together and intact, in a pan, the inspectors perform the current procedure (Table 1).

- b. Modified Method No. 1, which requires presenting for inspection the intestine, stomach, and spleen in a pan and the trachea, lungs, heart, and liver on a hook, the inspectors perform Procedure No. 1 (Table 2).

c. Modified Method No. 2, which requires presenting for inspection the intestine, stomach, spleen, and liver in a pan and the trachea, lungs, and heart on a hook, the inspectors perform Procedure No. 2 (Table 2).

3. Because Modified Method No. 2 seems to be more productive than the other two methods, at the test plant, and because Procedure No. 2 is as effective as the other two procedures, but makes the inspectors' work easier, inspection personnel:

- o Encourage plant management to operate with Modified Method No. 2.

- o Assure that heads, viscera and carcasses are properly presented for inspection.

- o Require the inspectors to perform all steps of Procedure No. 2.

SWINE INSPECTION WITH MODIFIED PRESENTATION AND CONTROL

APPENDIXES

Appendix A - Use of Worksheet

The worksheets (Appendix B) are designed according to the functions involved and are intended to be used for recording data necessary to evaluate and analyze the effectiveness of current and new swine post-mortem inspection procedures. They are to be used at the evaluation sites immediately after inspection, or as required by the project officer in charge.

Worksheet No. 1 is to be used for viscera evaluation; worksheet No. 2 for kidney evaluation. The worksheets include categories and subcategories. The information recorded should show: (1) tallied units examined, (2) tallied and total units with errors, and (3) total errors.

At the viscera evaluation site, one unit is represented by all abdominal and thoracic viscera. At the carcass evaluation site, one unit is represented by both kidneys, or by one kidney if the other one is missing.

The project officer in charge will determine where and how the units can be selected, notify the veterinary inspector in charge, the inspectors, and plant representatives, and instruct the evaluators when to begin the evaluations.

Appendix A (continued)

As instructed, the evaluators will examine 100 units for each procedure and use one worksheet for each 100 units. The units will be selected as randomly as possible throughout the day's operation and will include units from carcasses of swine as slaughtered and presented for inspection during the study.

To keep track of how many units are evaluated, an evaluator/recorder will tally each unit examined by entering a slash in each of the 100 circles at the bottom of the worksheet.

The numbers 1-15 across the top of the worksheet indicate the units with errors. Enter all errors found on the first unit in Column 1, all errors found on the second unit in Column 2, etc. Enter under pathology, or dressing errors, only those units with errors. If one or more errors are noted in one unit, tally them in the appropriate spaces next to the subcategories and in the same column. If several errors are of the same type, indicate the number in the appropriate space.

For contamination (feces, ingesta, urine, bile) enter an error when it is of sufficient extent that correction would have been called for if it had been recognized at the point of inspection.

Appendix A (continued)

The subcategory "Other" is for errors which may not be scored under other subcategories, or to identify an error which may be considered a particular problem. If more than one entry is to be recorded under "Other", identify the unit by circling the number at the top of the worksheet and enter such (circled) number in the "Remarks" space with the type of error(s).

If needed, the "Remarks" space is for clarifying certain tallied errors, or for recording any information pertaining to the evaluation process.

If evaluation of a unit reveals a disease or condition requiring condemnation of the unit, or part of the unit, tally such unit, record the necessary information in the "Remarks" space, and take appropriate action.

If evaluation of a unit reveals a disease or condition requiring the carcass to be re-examined and/or condemned, retain the carcass for "final" examination and disposition by the veterinary inspector in charge, notify the project officer in charge, and enter the necessary information in the "Remarks" space.

Appendix A (continued)

Consider both kidneys as one unit. However, tally errors found in left kidney in left spaces and errors found in right kidney in right spaces of same unit. If one kidney is missing and the other one is free of errors, tally the unit as acceptable.

All units will be thoroughly evaluated. All testing and evaluating procedures will be conducted without causing disruption of plant or inspection operations.

Upon completion of each worksheet, the evaluators will sign in the appropriate spaces and give the worksheet to the project officer in charge who will: (1) identify the procedure evaluated, (2) review all entries, (3) clarify any pathological or dressing errors, if required, (4) compute the raw totals, and (5) initial in the appropriate space.

Appendix B - Worksheets

WORKSHEET No. 1 SWINE VISCERA INSPECTION		1. Est. No.	2. Location (City, State)	3. Chainspeed	4. Procedure <input type="checkbox"/> Current <input type="checkbox"/> Procedure No. 1 <input type="checkbox"/> Procedure No. 2	5. No. of Inspectors	6. Date											
PATHOLOGY	CATEGORY - SUBCATEGORY		UNITS WITH ERRORS															TOTAL
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	7. Gastrointestinal tract	a. Gastritis, Enteritis																
	8. Mesenteric nodes	a. Abscess																
		b. Tuberculosis																
	9. Spleen Lesions (specify)																	
	10. Liver, Portal Nodes (Do not include parasitic lesions)	a. Abscess																
		b. Tuberculosis																
		c. Cirrhosis																
	11. Lungs	a. Abscess																
		b. Tuberculosis																
		c. Pneumonia																
		d. Other (specify)																
	12. Bronchial Nodes (specify)																	
	13. Mediastinal Nodes (specify)																	
	14. Heart (specify)																	
	15. Contamination (pathological)																	
16. Other Pathology (specify)																		
17.																		
DRESSING ERRORS	18. Contamination (feces, urine, ingesta, bile, etc.)																	
	19. Other Dressing Errors (specify)																	
20. Units Examined (Tally each unit)																		
① ② ③ ④ ⑤		⑥ ⑦ ⑧ ⑨ ⑩		⑪ ⑫ ⑬ ⑭ ⑮		⑯ ⑰ ⑱ ⑲ ⑳		㉑ ㉒ ㉓ ㉔ ㉕		㉖ ㉗ ㉘ ㉙ ㉚		㉛ ㉜ ㉝ ㉞ ㉟		㊱ ㊲ ㊳ ㊴ ㊵		㊶ ㊷ ㊸ ㊹ ㊺		
① ② ③ ④ ⑤		⑥ ⑦ ⑧ ⑨ ⑩		⑪ ⑫ ⑬ ⑭ ⑮		⑯ ⑰ ⑱ ⑲ ⑳		㉑ ㉒ ㉓ ㉔ ㉕		㉖ ㉗ ㉘ ㉙ ㉚		㉛ ㉜ ㉝ ㉞ ㉟		㊱ ㊲ ㊳ ㊴ ㊵		㊶ ㊷ ㊸ ㊹ ㊺		
① ② ③ ④ ⑤		⑥ ⑦ ⑧ ⑨ ⑩		⑪ ⑫ ⑬ ⑭ ⑮		⑯ ⑰ ⑱ ⑲ ⑳		㉑ ㉒ ㉓ ㉔ ㉕		㉖ ㉗ ㉘ ㉙ ㉚		㉛ ㉜ ㉝ ㉞ ㉟		㊱ ㊲ ㊳ ㊴ ㊵		㊶ ㊷ ㊸ ㊹ ㊺		

21. Remarks (If additional space is needed, use reverse)

22. Signature(s) of Evaluator(s)			23. Signature of Project OIC
A.	B.	C.	

Appendix B (continued)

WORKSHEET No. 2 SWINE KIDNEY INSPECTION		1. Est. No.	2. Location (City, State)		3. Chainspeed	4. Procedure <input type="checkbox"/> Current <input type="checkbox"/> New		5. No. of Inspectors	6. Date
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CATEGORY - SUBCATEGORY		UNITS WITH ERRORS															TOTAL
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
7. Kidney Conditions	a. Cysts	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
	b. Nephroses	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
	c. Abscesses	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
	d. Nephritis	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
	e. Other (specify)	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	
		/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	

8. Units Examined (Tally each unit)

1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19 20	21 22 23 24 25	26 27 28 29 30	31 32 33 34 35	36 37 38 39 40	41 42 43 44 45	46 47 48 49 50
1 1 1 1 1	2 2 2 2 2	3 3 3 3 3	4 4 4 4 4	5 5 5 5 5	6 6 6 6 6	7 7 7 7 7	8 8 8 8 8	9 9 9 9 9	10 10 10 10 10
11 12 13 14 15	16 17 18 19 20	21 22 23 24 25	26 27 28 29 30	31 32 33 34 35	36 37 38 39 40	41 42 43 44 45	46 47 48 49 50	51 52 53 54 55	56 57 58 59 60

9. Remarks (If additional space is needed, use reverse)

10. Signature(s) of Examiner(s)			11. Signature of Project OIC
A.	B.	C.	

Appendix C - Training Task Analysis

While the test study was conducted, a Program Training Division officer performed a detailed task analysis of the new inspection procedures.

The task analysis, which describes the work to be done in terms of performance, is a critical step in the development of any training endeavor. It enables the trainer to describe training objectives and to determine the most appropriate instructions to accomplish them. The task analysis may be used to develop self-instructional lessons or guides that are sufficiently explanatory so that all trainees can correctly perform assigned tasks as required. The production of self-instructional materials requires the prior approval of job requirements that are derived from an accurate, approved task analysis.

Appendix D - Statistical Analysis

The Mathematics and Statistics Division summarized and evaluated all data collected during the inplant evaluations and performed a statistical analysis. During this analysis, estimates of percentages of error-free units, based on the number of errors missed by the inspectors, were computed for the units inspected with the current and new procedures. The percentages computed for one procedure were compared with those computed for the other procedures.

The results for the three procedures tested were summarized in Table 3, Summary of Viscera Evaluation Results, and Table 4, Summary of Carcass (Kidney) Evaluation Results. These tables show the inspection procedures, the units evaluated for each procedure, the units free of errors, and their percent and confidence intervals.

A 95 percent confidence interval was calculated for each percent. It is expected that the true number of error-free units is contained in the 95 percent confidence interval. If the

Appendix D (continued)

intervals overlap there is no evidence of a difference in error rates. No differences were detected except between the pathological error rates of the Current Procedure and Procedure No. 1. In this case, Procedure No. 1 had a higher percent of error-free units than the Current Procedure; otherwise, there was no difference in error rates among the three procedures.

Appendix E - Workload Analysis

Upon completion of the effectiveness evaluations, work measurement data were collected to determine the time and staffing required to perform the new inspection procedures at different production rates.

Inspectors were work measured while performing the new procedures. This included video taping different inspectors at the evaluation sites. The project manager scheduled the work measurement to be conducted in the plant. He was present during data collection to assure that the inspectors performed the procedures correctly, to recommend the time of data collection, and to arrange for inspectors rotation at the different work stations.

The work measurement data were analyzed to determine the standard times necessary to perform the new procedures. Time in minutes, seconds, and hundreds of a second was superimposed on video taped work measurement data. Task elemental work times necessary to perform inspection elements were calculated.

Elemental work times are the times necessary to perform specific tasks of an inspection procedure. Elemental work tasks include

Appendix E (continued)

reach, incise, and palpate. The time required to perform each work element of the new procedures was taken from work measurement data collected on videotape. These elemental work times were statistically analyzed and their average was calculated.

Scenes of inspectors performing the inspection tasks were viewed and rated by a panel of trained raters from various Agency programs. The panel's ratings were applied to the average work elemental task times. Difficulty adjustments were added to the time values to allow for additional body, arm or hand movements, or difficult eye-hand coordination. The resulting times were used to calculate the maximum inspection rates with various staffing requirements.

The results of this analysis indicate that, at the test plant, both new procedures would increase inspection productivity by 5 to 7 percent. This productivity improvement will be obtained by following the correct presentation methods and by properly performing the required inspection procedure.

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